

"Big Bang" machine to get huge upgrade in 2020

Robert Evans, Reuters

Physicists from around the globe launched a major program on Wednesday aimed at converting the LHC "Big Bang" particle collider at CERN near Geneva into a vastly more powerful cosmic research machine by the year 2020.

CERN officials said the effort, involving scientific establishments in the European Union, the United States and Japan, would demand development of new technologies in fields ranging from super-conducting magnets to energy transfer lines.

The upgrade will enable the operators to carry out up to 10 times as many collisions, or luminosity, in the LHC as the hundreds of millions a second now, and to gain deep insight into the origins and make-up of the universe.

"With processes so rare, extra luminosity makes a big difference to our ability to make precision measurements and discover new things," said Sergio Bertolucci, research director at CERN, the European Organization for Nuclear Research.

The program was put in motion at a meeting of scientists and engineers from participant countries to plan how work will be coordinated, CERN said.

The collisions, in which particles are smashed together at just a fraction under the speed of light, produce computer-monitored explosions that have been dubbed "mini-Big Bangs."

The LHC, or Large Hadron Collider, runs around a 27 km (16.8 mile) circular tunnel under the borders of Switzerland and France. It has been in operation since March 2010, producing a wealth of data for physicists and cosmologists.

Scientists at CERN monitoring the collisions have spotted some puzzling events, but so far nothing has emerged that takes man's knowledge clearly beyond what they call the Standard Model of how the cosmos works.

HIGGS BOSON

Physicists are hoping that a small luminosity increase, for which preparations will be made during the two-month winter shutdown from next month, will help produce evidence next year of the existence of a particle, the Higgs Boson, thought to give mass to matter.

Establishing exactly how the debris of the "Big Bang" 13.7 billion years ago came together to form stars, planets and the other stuff of the universe is one of the prime targets of the LHC in its initial phase.

But later on, after a year-long shutdown at the end of 2012 during which the LHC

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will be adapted to double its luminosity, CERN researchers will be looking for what they call "New Physics" or phenomena beyond the Standard Model.

These could include insight into what is the "dark matter" making up some 23 percent of the universe, the idea of "super-symmetry" which helps explain the properties of gravity, and what is the "dark energy" driving expansion of the universe.

However, the 10-fold upgrade being planned for 2020 could take man's knowledge far into the realms of what at present is pure speculation on subjects like the true nature of time and the possible existence of other universes.

Taking part in preparations for what will be called the High Luminosity LHC will be Japan's KEK and the U.S. LARP network of laboratories, which include Fermilab near Chicago whose long-running Tevatron collider closed down in September.

(Reported by Robert Evans; Editing by Tim Pearce)

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